

What is claimed:

1. A spread spectrum meter reading system, comprising:
 - a plurality of end point encoder transmitter devices each of which is operably connected to a utility meter and transmits high power frequency hopping spread spectrum signals containing at least metering data for the corresponding utility meter;
 - a plurality of intermediate transceiver units, wherein the number of intermediate transceiver units is less than the number of end point encoder transmitter devices and wherein each of said intermediate transceiver units receives and retransmits the high power frequency hopping spread spectrum signals; and
 - a base station having a receiver that receives the high power frequency hopping spread spectrum signals.
2. The system of claim 1, wherein the high power frequency hopping spread spectrum signals comply with FCC Part 15.247.
3. The system of claim 1, wherein the high power frequency hopping spread spectrum signals are transmitted at a maximum hopping rate of at least one minute per hop.
4. The system of claim 1, wherein the high power frequency hopping spread spectrum signals include at least twenty five channels, at least two of which are reserved as acquisition channels.

5. A meter end point encoder transmitter device, wherein the device is operably coupled to a utility meter that forms part of a utility meter reading system, the device comprising:

a radio frequency sub-system that transmits consumption data from the utility meter using frequency hopping spread spectrum signal; and

a digital subsystem, wherein the digital sub-system includes a first processor and a second processor, wherein the first processor runs continuously and controls the operation of the radio frequency sub-system, and wherein the second processor runs only upon utilization of the radio frequency sub-system.

6. The device of claim 5, wherein the first processor operates at a low speed and the second processor operates at a high speed.

7. The device of claim 6, wherein the first processor and the second processor are comprised of two distinct processors.

8. A meter end point encoder transmitter device, wherein the device is operably coupled to a utility meter that forms part of a utility meter reading system, the device comprising:

a radio frequency sub-system that transmits consumption data from the utility meter using frequency hopping spread spectrum signal; and

a digital subsystem, wherein the digital subsystem is powered by a battery and wherein upon nearing a time for the radio frequency sub-system to transmit the digital subsystem directs a charge pump capacitor to charge, and once the charge pump capacitor

is charged the digital sub-system enables at least a portion of the radio frequency sub-system to run off the charge pump capacitor during the consumption data transmission.

9. The device of claim 8, wherein utilization of the charge pump capacitor by the radio frequency sub-system during transmission limits a drain on the battery.
10. The device of claim 8, wherein the digital subsystem includes a first low-speed processor and a second high-speed processor, and wherein the first low-speed processor monitors the status of the battery and transfers the status of the battery to the second high-speed processor.
11. A utility meter reading system, comprising:
 - a plurality of meter end point encoder transmitter devices each of which is operably connected to a utility meter and transmits data using a low-speed frequency hopping spread spectrum mode; and
 - at least a base unit that receives transmissions from the plurality of encoder transmitter devices,

wherein upon installation of one of said plurality of meter end point encoder transmitter devices, the installed meter end point encoder transmitter device operates for an initial period of time in a installation mode that uses a high-speed frequency hopping spread spectrum mode.
12. A utility meter reading system, comprising:

a meter end point encoder transmitter device operably connected to a utility meter; and

at least a base unit,

wherein the meter end point encoder transmitter device transmits consumption data to at least the base unit by utilizing frequency hopping spread spectrum and wherein the transmitted consumption data is in the form of a plurality of buckets of data, each bucket representing a period of time of consumption data from which the base unit may retrieve desired consumption data.

13. The system of claim 12, wherein the base unit utilizes a time and frequency transmission collision avoidance scheme in combination with the bucket transmission.
14. A spread spectrum meter reading system, comprising:
 - a plurality of end point encoder transmitter devices each of which is operably connected to a utility meter and transmits frequency hopping spread spectrum signals containing at least metering data for the corresponding utility meter;
 - a plurality of intermediate transceiver units, wherein the number of intermediate transceiver units is less than the number of end point encoder transmitter devices and wherein each of said intermediate transceiver units receives and retransmits the frequency hopping spread spectrum signals; and
 - a base station having a receiver that receives the high power frequency hopping spread spectrum signals,

wherein each of the encoder transmitter devices and the transceiver units incorporates a transmission counter value maintained by that device or unit that is used to calculate latency information, and wherein the base station time stamps each received transmission with a real time clock such that accurate calculation of the actual meter reading time can be determined from the combination of the time stamp and the latency information.

USPTO Patent Application
Serial No. 16/625,444
Docket No. 1725.123-US-02
File Date: 06/21/2020
First Inventor Name: SONG, JIAPING